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ABSTRACT

While the need to strengthen the transfer of language skills across disciplines and to integrate language instruction with other components of the curriculum is recognized, it must also be recognized that the language of science has a set of symbols that are different from those that are learned for daily life, and the structures of the two systems are not always the same. In addition, the language of printed materials in science is not always identical to that of the classroom. Because language and subject content are closely related, a valid approach would be to teach English through science rather than English for science. In this context, language should be treated more as communicative than as instrumental or functional. This would blur the distinction between science and language instruction, although each would have its emphasis: science instruction would focus on the instrumental and heuristic functions of language, and language instruction would focus on the interpersonal, thematic, and symbolic functions of language. The concept behind language across the curriculum is based on the recognition of a continuum from conceptualization to communication and of the unity of language and learning. (MSE)

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LANGUAGE THROUGH SCIENCE AND SCIENCE THROUGH LANGUAGE: AN INTEGRATED APPROACH

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LANGUAGE THROUGH SCIENCES

AND

SCIENCES THROUGH LANGUAGE

AN INTEGRATED APPROACH

by

K Chellapan

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Language is learned most effectively when it is not taught simply as language. The current world-wide awareness of the need for teaching of English for scientific purposes has not only the practical purpose of specifying the contents of the language course but integrating language education with the other components of the curriculum and there is need to strengthen the unconscious transfer of skills across the curriculum and the class rooms.

If in a sense all learning is learning a language, there can be no real language learning without learning something else. "We mean to suggest that language skills are required throughout the whole of the curriculum, for mastery of any subjects; but we mean also to suggest that these language skills can be developed and strengthened through—by means of—the various subjects and activities of the whole school curriculum".[1]

The concept of interdependence of linguistic skills and cognitive skills, of language and life, of language and learning has led to the conception of a curriculum across the walls (may be without the walls too). To start with the child, a child's mastering of life and the creation of self are dependent upon his creating a language. The child is as much intoxicated with the symbols as with what they signify and it tries to master them both simultaneously. "The relationship between developing language and developing life is too entangled to be seperated".[2]

All reality is created, and for that a symbolic code is needed. The more, the child masters the complex structures it acquires a more complex model of reality, which is modified and expanded through experience. If all experience is filtered through or created by language, the child also learns to use language instrumentally, cognitively and symbolically only in relation to the experience or reality. But language does not simply reflect but determine as well as clarify and contribute to the reality we create. The possibility of perceiving the ants either as individuals or as cells is a case in point.[3] All communications have both a linguistic and experiential reality. To quote Wallwork, "The extent to which any individual successfully uses the functional capacity of language dependends on the language capacity of the individual, which in turn depends on his experience of 'reality' including the reality that is language".[4]

Based on the recognition of this independence of acquiring a world view and the language in childhood, the Bullock report has asked for an extension of this in the class room, "The two processes cannot be independent. The effort a child needs to apply in learning language must derive from the satisfaction of evolving from helplessness to self-possession. Conversely, that very evolution must owe a great deal to the developing power of language as its instrument. What we advocate here is not more than that this interlocking of the means and the end should be maintained if possible, thoughout the years of schooling".[5]

In a child, conceptionalisation is dependent on acquiring of language structures which is again facilitated by the universal language or the underlying semantic notions from which the child organises the deep dependencies and relationships of his language. This process is made explicit and systematic in the class room by developing both communicative and analytic competence, "Analytic competence is not acquired 'naturally', as is communicative competence, but is acquired through formal education by means of being engaged in intellectual pursuits. In school, knowledge is 'decontextualized', made abstract, and schooling demands analytic competence for the pursuits it requires of the students".[6]

What is the role of the language teacher and the subject teacher in the integrated development of students skills? Only through language, concepts are presented—but it is the language of a particular discipline, superimposed upon the universal cognitive and linguistic processes.

If science needs no language in a sense, it cannot be denied that science is 'language'—and each science is a language in the sense that it is a mode of comprehending reality. If there is stripping of connotations in one stage—more of intension than extension, there is a difference kind of symbolisation. To quote J Bronowski, "And thought does not survive without symbolic concepts".[7]

Its low redundancy itself necessitates complexity of symbolisation of a different kind—and the interdependence of parts which define and support each other and the way in which words are used to dissect and define reality makes the langunge of science more desemanticised, but their structural potentials are more fully tapped. Language becomes all structure and thereby comes closer to the structure of thought. But again there is a difference between the conceptual structure and the linguistic patterning. It has been said that the linguistic formulation is a poor representation of the complex three dimensional flow of thought and decoding the message presupposes a number of processes which require not only knowledge of scientific facts but cognitive and linguistic skills, and only when scientific experience can be linguistically grasped, the students have a mastery over the experience itself.

If science strips language of extra-dimensions, it can never be grasped as pure experience and verbalisation is essential, but the categories of language and the categories of scientific experience are not identical, though both converge in cognitive or logical categories and processes. Advocates of E.S.P. have been arguing that scientific language is closer to the core language or universal thought processes, but they are never identical. L.S. Vygotsky has distinguished between the ability to form concepts and the ability to define them and a concept acquired in a concrete situation cannot be easily defined verbally and the verbal definition will be narrower than might have been expected from the way in which he used the concept. Because to the child concept begins with the whole, and language begins with the word, "thought and language are intersecting circles and not identical and congruent shapes".[8] Based on this, Flower concludes, "Word meanings evolve; they multiply so that a word takes on more and more connotations, but as each of these connotations becomes more precise, we have to elaborate the verbal structures that frame the words of potent lexical meaning to give further precision to our thought".[9]

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This difference is manifested in the structuring of [illegible] language which corresponds to the structure of thought upto a point, but it has its own patterning. The emphasis is here on linearity and succession and the discourse is woven through definition explanation expansion and generalisation and the overall mode is both hierarchical and analytic, the difference between the conceptual linguistic paragraphs is a clue to this difference and even at the sentence level, word arrangements, particularly devices resulting in postponed meaning result in difficulties. In most science texts, language is not explicitly communicative, because it is stripped of the sinews of strength provided by the strange irregular rhythm of life and language is more information-loaded and enactive than expressive. There is also a world of difference between the language of the text and the language of the lecture-cum-demonstration. The latter is relatively more communicative (but even here there is a change to an artificial role in the class room) because the text book converts science into a different discourse altogether.

The Curriculum not only decontextualises knowledge, making it abstract but also fragments it, hence language across the curriculum can vitalise knowledge or content as well as charge language with contextual significance. Education is knowledge and symbolisation and simple acquisition of science without the mode of language is inadequate-if not impossible because language is the most important mode of acquiring and clarifying concepts and without this symbolisation, there can be growth of meanings. Language provides not only the mechanism for concept formation but also an effective way of deploying the knowledge. If the pupils form and connect concepts by thinking through a problem, they achieve clarification and mastery of the experience by 'taking out' a solution "It is in the verbal teasing out of one's thinking that one learns to think effectively. Speech is therefore the primary instrument of thought and there is a process 'taking one's way through' ideas which is essential to learning".[10]

Every teacher is a language teacher in two senses: While teaching a subject, he is also creating a language because each discipline has its own language. Secondly, as a teacher of Mathematics has said, "We just have to wait until the proper point of view and corresponding language for presenting it are revealed". Commenting on that J.B. Pride referred to the role of the subject teacher "as translator, determined to get 'what' he wants to say 'across' to his pupils. He then makes a distinction between this language and the kind of language that belongs to the English lesson, much more a form of activity, "that can originate from and be given direction by the pupils themselves".[11] With the support of Britton, he finally arrives at the distinction between language in the science class as communication and the language in English lesson as communion. The English lesson according to him should be a place where more talk is valued.

But can there be a pure language lesson—independent of some subject? It is this concept which is now being universally questioned and language has to be related to some experience or subjects. That means — if all language is in a way, a subject (including literature) all subject teachers are also language teachers. But there is this difference; in the subject lesson, the emphasis is on conceptualisation through concretisation, whereas in the language class the emphasis is on communication and communion which can again contribute to both conceptualisation and concretisation in a different way and the different purposes are achieved through different structurisation of reality as revealed in the structure of the lessons, the language used and other

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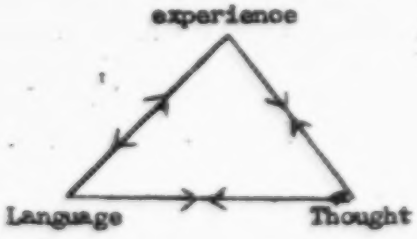
pedagogic aids. In the science class language is closer to conceptualisation or doing. In the language class language is more of communication and communion. The language through science class converts concepts into language and makes learning more personal, and it concentrates on the cognitive, communicative and symbolic potentials. The science teacher and the science text use language but they don't teach it, the language teacher uses science and scientific facts, but he does not teach science but a good science class is to make the student acquire an experiential knowledge of the laws underlying the natural phenomena and his knowledge of reality is supported and clarified by visual aids as well as by language. Even in humanities, words like democracy are better understood not when they are paraphrased but when the key word 'democracy' is presented along with the various components of democracy in a concrete situation, and it is placed in relationship with inter-related concepts. Every discourse generates its own language and its linguistic structure is inseparable from or provided by its conceptual structure. But this is reversed in the language through science lesson. Here the emphasis is on meaning creation and, "opening up the ranges of language use for the child, valuing and utilising the ranges at his disposal, can provide entry points into the new meanings that subject areas may offer him".[12] In the laboratory, concept learning is almost inseperable from doing. In the science through language class, concept learning unconsciously facilitate language learning. But in the language through science class, linguistic skills and structures consciously reinforce and vitalise conceptualisation through communication.



Language, experience and thought always seem to be involved in a triangular relationship, in the mapping of reality and if in the science class, language is subordinated to conceptualisation which is made possible through concrete experience, in the language through science class the emphasis is again on concepts, but in relation to linguistic structures vitalised in the dynamics of communication.

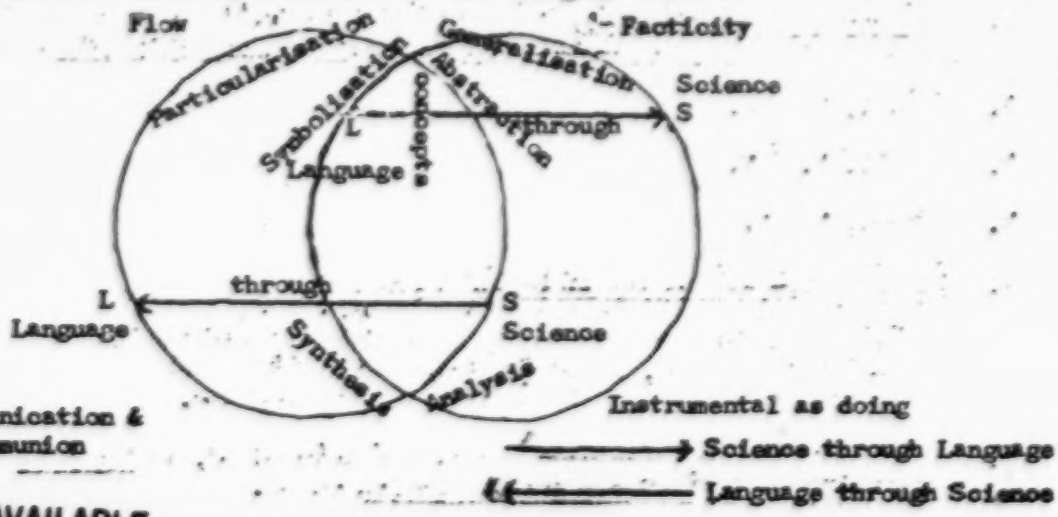
Let us see how far the structuring of lessons in, "Jennifer Smith & Bernard Coffey's English for Study purposes (SEAMEO - RELC 1982) fulfils or taps the communicative potentials of the language learner. The overall organisation of the general theme from introduction to Energy to Solar Energy and Energy in Space takes into account the development of scientific concepts as well as linguistic facts, but through an integration of cognitive and communicative skills. The visual language is as much important as verbalisation and in developing the students' ability to work through language to the structure of scientific thought, it rightly emphasises the role of connections, ordering, discrimination, summarising and reporting as well as transferring information from charts to texts and vice versa. Even in dealing with specific linguistic skills such as precision of vocabulary, contextualisation contributes a lot. Language items are made communicative devices and they are linked with larger skills and 'topics' provide the base for these activities. Meaning generation both at the vocabulary level and in the large units is linked with the context of the discourse, it contributes to create a language.

But one has the feeling that the lessons could be made more communication-oriented than language-centred. In other words we would prefer English through Science and not English for Science and language should have been given more communicative and symbolic orientation than fulfil referential or instrumental purposes. We would expect more of the teacher of subject-cum-language who can share particular ways of seeing with his pupils' as indicated by L Roberston and more of conversion of general statements into particular or individual meanings.

The Gul Mohar Readers (Orient Longman, 1952) are not exclusively concerned with science lessons, but lessons such as Television, The Day of the Dinosaur, and The Human Being and the Dinosaur place scientific facts in a larger perspective, and though the language is less specialised and more 'humanised', it is felt that exercises could be more elaborate and the classifications more communication-oriented.

We have so far seen that symbolisation and conceptualisation are twin aspects of a complex process and the two vitalise each other. But if in the science class both are closer to experiential reality, what the language class does is to analyse their structure as well as vitalise them by drenching them in the complex texture of living and communication. It is also the dialectics of the essential and the existential, the general and the particular or individual meaning and in both 'thought processes' are important, but in one case vitalised concepts by factual realities and in the other symbolic or communicative potential of language. What is embryonic or inarticulate in the discourse or lesson of science is made articulate in the discourse of the language class which is created by the teacher and the class.

Education is now-a-days product-oriented rather than process centred and the abstract or the symbolic mode of education as institution not only fragments knowledge but distances it from the learner's life. The policy of language across curriculum could be a major step towards re-integration of learning a language with learning to live and of linguistic and cognitive skills. More specifically if the subject or science teacher while teaching concepts through 'doing' is also unconsciously contributing to the creation of a language, the language teacher can vitalise those concepts by converting them into living tissues of communication and symbolisation. If the science through language teacher can integrate language learning with concept formation and contribute to language as an exploration of reality as well language as 'doing things', the language through science teacher can enrich that process by enhancing the analytic and communicative skills of the learner which are embedded in the structure of scientific thinking itself. See the diagram below:



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Usually the near dumbness of the scientific discourse is contrasted with the almost anarchic flow of an uncompromising communication class. The pull of scientific language as well as the science teacher is towards facticity and that of the language class towards the flow of communication and symbolisation, but all facts needs symbolisation which again must be rooted in facts.

And this would almost blur the distinction between science and language classes, because in both the classes, both will be taught and each will be the part of the other. From our point of view, in the science class, the focus will be on the instrumental and heuristic functions of language and in the language class on the interpersonal, thematic and symbolic functions. But in both there is conceptualisation and communication. If language provides the core for conceptualisation, science is embryonic communication. That is why we would insist on a balance or a conscious link between science and language as doing and science and language as communication.

To conclude, there is a continuum from conceptualisation to communication and in one case it is closer to doing and in the other, to symbolisation. Language across curriculum based on the recognition of this continuity and unity can contribute to an integration of conceptualisation and communication and of language and learning, of language learning and learning through language.

Notes

1. W A Gatherer & R B Jeffs (ed.), Language Skills Through The Secondary Curriculum. (Edinburgh: Holmes McDougall Ltd., 1980), p. 16.

2. J F Wallwork, quoted in Language Skills Through The Secondary Curriculum, p. 17.

3. J F Wallwork, 'Language Development' in Language Skills Through The Secondary Curriculum, p. 53.

4. Ibid., p. 54.

5. Ibid., p. 58.

6. W.A Gatherer, 'Language and thinking', in Language Skills Through The Secondary Curriculum, p. 63.

7. Science and Human Values, quoted in F D Flower, 'The Language of Science,' in Language Skills Through The Secondary Curriculum, p. 194.

8. Ibid., p. 197.

9. Ibid., p. 197.

10. Ibid., p. 65.

11. J B Pride, The Social Meaning of Language, (London: Oxford University Press, 1974), p. 83. Whereas J B Pride associates Science with Communication in the non-technical sense, communication, we would link both Communication and Communion with the language Class.

12. Trevor Messenger, "Language Across the Curriculum", in Language Skills Through The Secondary Curriculum, p. 84.

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